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Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted
a patent (Rule 4.17(ii)) for the following designations AE,
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,
CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE,
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TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA,
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AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT,
BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR,
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TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
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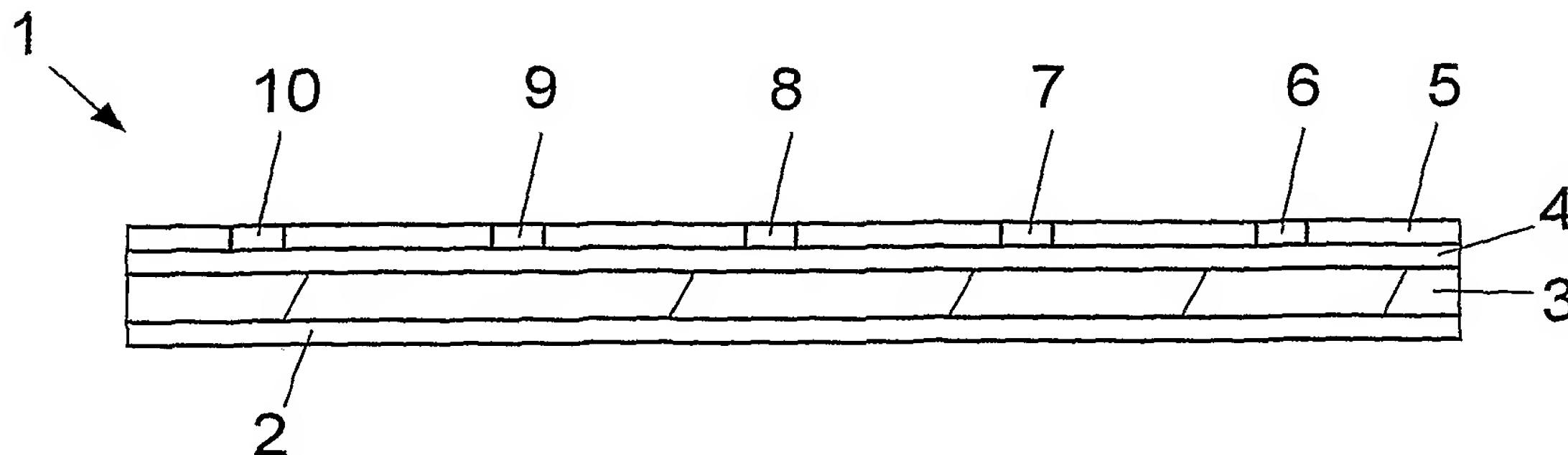
— as to the applicant's entitlement to claim the priority of the
earlier application (Rule 4.17(iii)) for all designations
— of inventorship (Rule 4.17(iv)) for US only

Published:

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For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: A PACK



(57) Abstract: A pack suitable for housing liquid and/or solid-liquid contents whose wall comprises a layer of board (3), an inner layer (2) sufficiently impermeable to create a seal between the board (3) and the pack's contents, and an outer protective layer (4, 5) covering the board (3), wherein the pack's layers are microwavable and the outer layer (4, 5) is breathable.

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A PACKField of the Invention

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The present invention relates to packs suitable for housing liquid and/or solid-liquid contents. The invention relates particularly to packs which are destined to operate in ovens utilising a combination of microwave, conventional heat and forced air technology for rapidly cooking the food products for the convenience of the customer. The invention
20 has particular applications in packs which contain one or more absorber pads such as that of PCT/GB03/03641.

Background to the Invention

25 In the field of packs which operate in combination ovens using microwave and conventional heat, the range of suitable materials to withstand high temperatures typically in excess of 240° whilst not being hazardous to microwaves is limited. For example, aluminium foil containers such as those commonly employed in drink cartons are not suitable for microwave usage and will also not withstand other high temperatures.

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Furthermore, conventional plastic packaging which are now widely used as microwavable packs are not suitable for combination oven operation.

One of the objectives of the invention is to provide a pack which has an inner surface sufficiently permeable to prevent the pack's contents from leaking through the wall's of the pack. This would be particularly detrimental in the eyes of the customer handling the pack and may even be hazardous to the customer bearing in mind the high temperature of cooking used in this technology.

A further objective of the invention is to provide a pack which is sufficiently rigid to contain the food elements or other contents without readily collapsing on itself, thus allowing the pack to be handled without undue difficulty by the customer.

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A further objective of the invention is to provide a pack that does not unduly change its appearance despite being submitted to elevated temperatures. Another objective of the invention is to present a pack which incorporates specialist layers of ink and varnish which survive the arduous cooking process.

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Summary of the Invention

In a first broad independent aspect, the invention provides a pack suitable for housing liquid and/or solid-liquid contents whose wall comprises a layer of board, an inner layer sufficiently impermeable to create a seal between the board and the pack's contents, and an outer protective layer covering the board, wherein the pack's layers are microwavable and the outer layer is breathable.

By 'breathable' we mean sufficiently porous that, if the pack is microwaved, the outer layer can permit moisture or any gas or still any potentially deforming substance trapped in the pack's wall escaping through the layer. This combination of features effectively allows the pack to withstand temperature rises and microwaving without the packs layers blistering, bubbling or otherwise unduly disfiguring.

This combination of features is particularly advantageous in the specific application of combination oven cooking with microwave and conventional heat in excess of 240°C. It is also particularly advantageous because the pack in these conditions will be able to retain its configuration, particularly in terms of colour, structure and surface smoothness.

The pack will also be particularly advantageous because it simultaneously retains its impermeable aspect so that it will tend to protect the customer from leaks through the pack's wall which could be an important commercial deterrent to would-be purchasers but may also be hazardous to use.

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In a subsidiary aspect in accordance with the invention's first broad aspect, the outer layer is a varnish and a further layer is provided between the varnish layer and the board which is of ink and which is breathable. This configuration will be beneficial because it will have the effect of essentially preventing the disfiguration of the printed portions which are
10 those portions which usually primarily catch the eye of customers.

In a further subsidiary aspect, the breathable region is substantially limited to the ink layer area. Whilst it is believed that a certain degree of disfiguration may be tolerable in certain areas of the pack, disfiguration of the printed region would be particularly detrimental and
15 therefore only rendering the ink layer area breathable would achieve an improved level of pack appearance without increasing the cost of rendering the entire outer pack layer breathable.

In a further subsidiary aspect, the breathable region comprises perforations spaced within
20 the range of 5mm to 40mm. Within this range the perforations almost entirely prevent undue disfiguration of the pack. Whilst above that range noticeable disfiguration occurs.

In a further subsidiary aspect, the pitch of perforations is substantially 20mm. At these levels, no noticeable disfiguration occurs when the packs are used in combination ovens.

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In a further subsidiary aspect, the perforations are strips. Conventional forms of scoring apply circular pores onto a layer. Applying strips is advantageous for certain types of designs.

30 In a further subsidiary aspect, the outer layer is formed by strands of appropriate material with gaps formed between the strands acting as breathable regions. Traditionally, the outer layer is applied to cover the entire outer pack surface and perforations may then be applied by penetrating the outer surface. In this instance, the outer layer is formed by

strands with gaps formed between the strands acting as breathable regions so that a single step of applying the outer layer is required rather than the traditional two step process of covering the outer surface of the pack and then penetrating the outer surface.

- 5 In a second broad independent aspect, the invention provides a sheet comprising a layer of board covered by an impermeable layer on one side and a protective layer on the other side covering the board, wherein the layers are microwavable and said protective layer incorporates a breathable region or regions. This configuration is particularly advantageous because it provides a sheet which may be folded into a pack having the
10 advantages as outlined with reference to the first broad inventive aspect. It may also be used in other forms in combination cooking where its advantages of not unduly disfiguring at high temperatures and in microwave situations would come to light.

Brief Description of the Figures

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Figure 1 shows a cross-sectional view of a portion of the wall of a pack or sheet in accordance with a first embodiment.

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Figure 2 shows a cross-sectional view of a portion of a pack's wall or sheet according to a second embodiment of the invention.

Figure 3 shows a cross-sectional view of a pack's wall or sheet in accordance with a third embodiment of the invention.

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Figure 4 shows a further cross-sectional view of a pack's wall or sheet in a fourth embodiment of the invention.

Figure 5 shows a schematic perspective view of a board surface in accordance with a fifth embodiment of the invention.

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Figure 6 shows a close-up plan view of a region of a pack's wall or sheet in accordance with a sixth embodiment of the invention.

Detailed Description of the Figures

Throughout this specification, the term “perforation” is to be interpreted broadly and will include within its scope cuts and scores.

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Figure 1 shows a portion generally referenced 1 of a pack's wall or sheet comprising an inner impermeable layer 2. The inner impermeable layer 2 may be of PET (polyethylene terephthalate) or any other material suitable for creating an impermeable layer whilst being microwavable and heatable to a temperature of say 270°C. The structural strength
10 of the pack will mainly be provided by the board layer 3 which may be of cardboard or any other appropriate board microwavable and heatable to temperatures in excess of 260°C as selected by the person skilled in the art.

On the outside of the board a layer of ink referenced 4 may be applied to mark the board
15 with its trade mark or any other advertisement material. The invention also envisages the use of inks incorporating compounds to cause them to withstand temperature in excess of 260°C. In order to prevent the disfiguration of the board a protective varnish layer 5 is applied. The varnish will be selected by the person skilled in the art to be suitable for heating at temperatures in excess of 260°C and microwavable. The protective layer 5
20 comprises a number of perforations such as those referenced 6, 7, 8, 9 and 10.

These perforations may be formed by a screening process or any other appropriate manufacturing technique as selected by the person skilled in the art. The perforations illustrated perforate only the varnish layer.

25

Figure 2 shows a further portion generally referenced 11 of a pack's wall or sheet. Similar components to portion 1 have been referenced by identical numerical references. The perforations 6, 7, 8 and 9 traverse both the ink layer 4 and the varnish layer 5. In this instance, layer 4 and layer 5 form the breathable region of the pack which will limit any
30 blistering, bubbling or undue disfiguration of the pack. These perforations may be set at 20mm from one another in order to ideally achieve this effect.

Figure 3 shows a further portion generally referenced 12 where identical components have retained identical numerical references. In this embodiment the perforations 6, 7, 8, 9 and 10 traverse layers 5 and 4 and partly extend into the board layer 3.

5 Figure 4 shows a further pack wall or sheet portion generally referenced 13 where identical components have retained identical numerical references. In this instance the ink layer covers only a portion of the board and it is at this portion that perforations 6 and 7 are present and extend through a varnish layer 5, an ink layer 4 and partly through board layer 3.

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Figure 5 shows a portion 14 of a pack's wall or sheet with a top layer 15 of varnish applied on the top surface. Strips such as those referenced 16 and 17 are applied to the pack to achieve a breathable region in order to avoid undue disfiguration of the pack particularly in combined oven applications. The strips of the kind of strip 16 alternate
15 with strips of the kind of strip 17 so as to achieve a compromise between structural strength of the pack and breathability.

Figure 6 shows a close-up view of the region of a pack's wall or a sheet. The outer protective layer is formed of strands of appropriate material such as those referenced 19
20 and 20 which leave gaps such as that referenced 21 to achieve breathability.

The strands' material may be selected from known alternatives by the person skilled in the art.

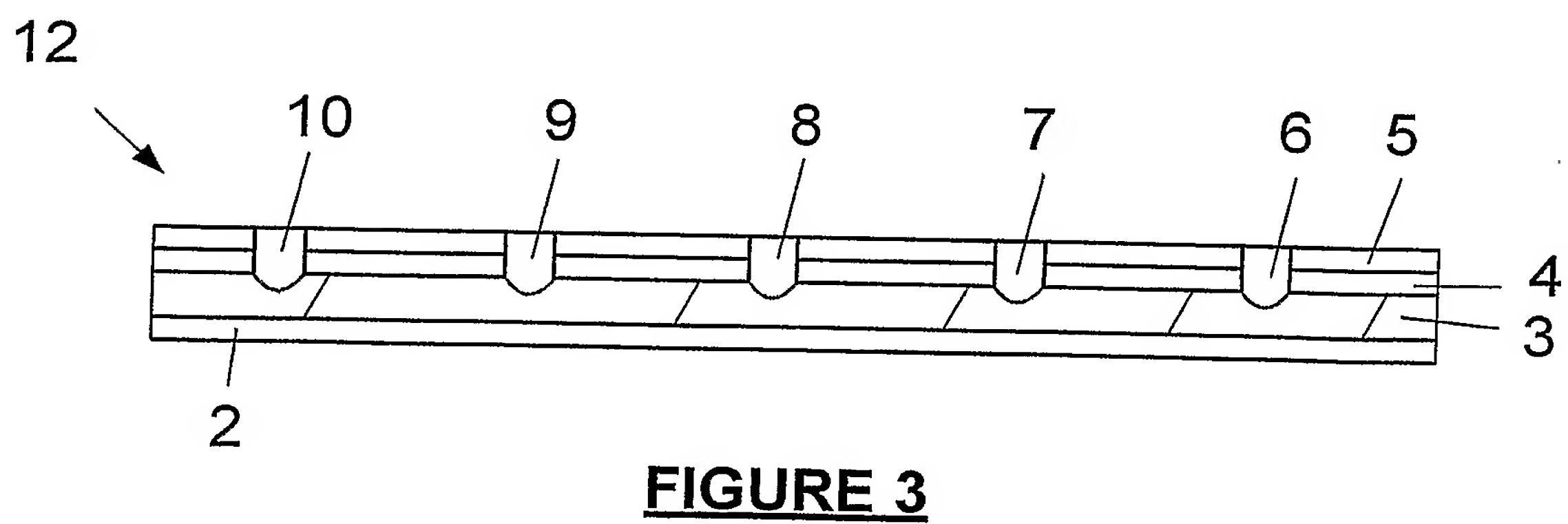
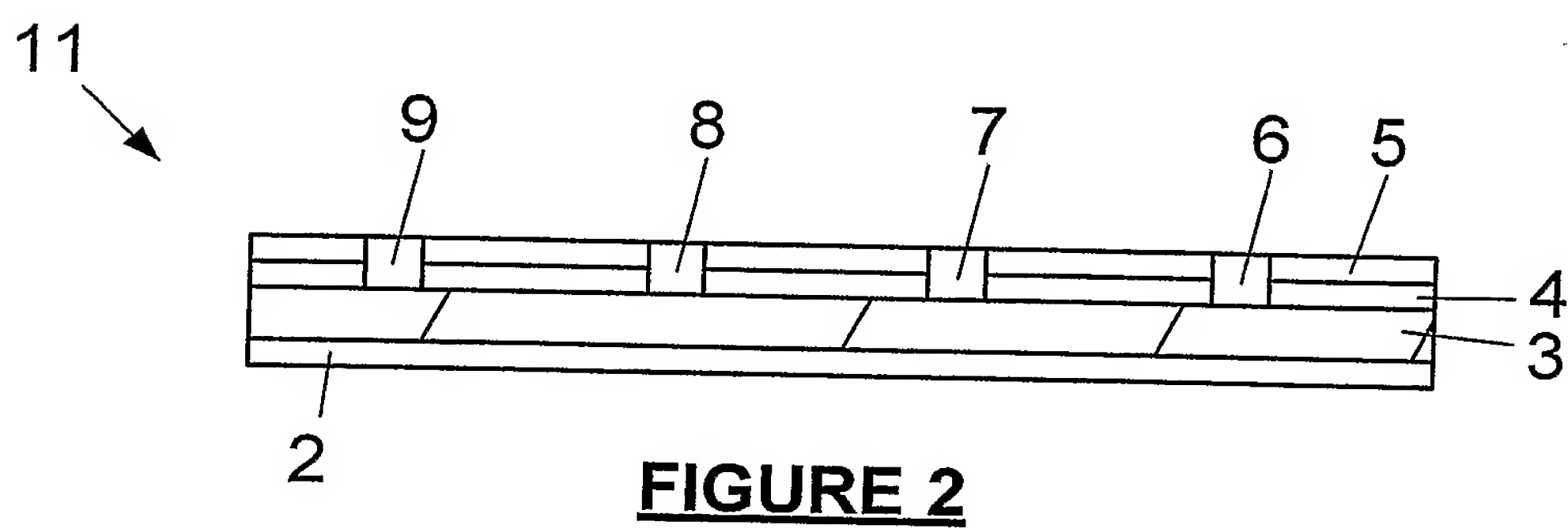
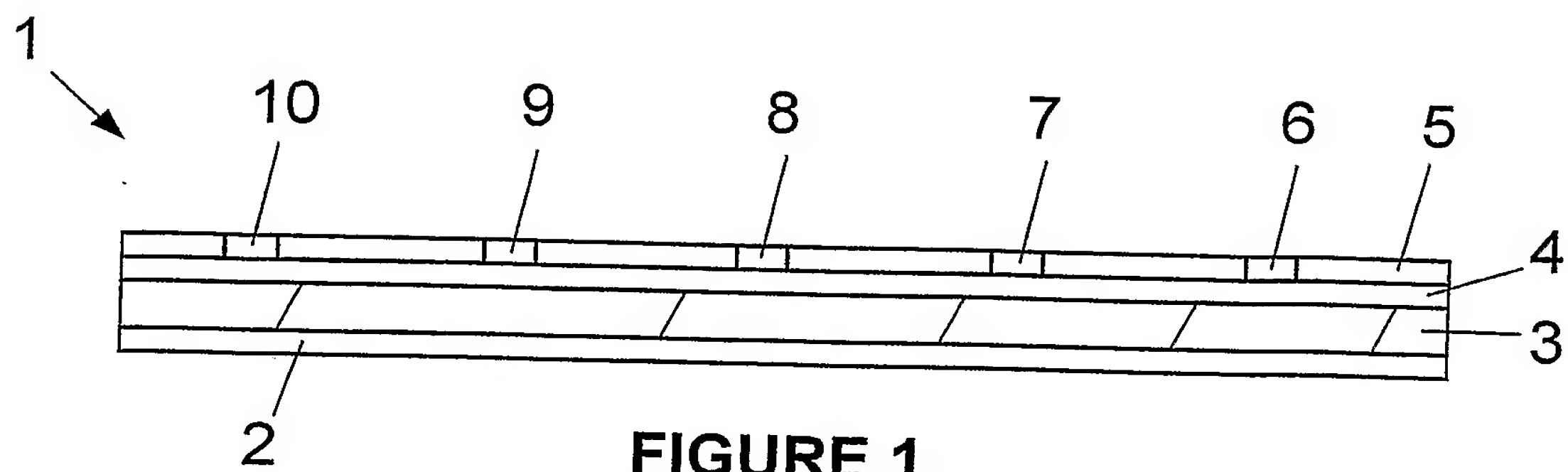
25 The orientation of the strands may be selected by the person skilled in the art to contribute to the structural strength of the pack if appropriate.

The invention also envisages a pack with a board, sections of which are selected to be blank of any ink or varnish. The blank sections would allow any water trapped in the
30 board during manufacturing of the pack to freely escape during the cooking process of the pack. In this configuration, the blank sections would fulfil the necessary breathable function of the pack.

CLAIMS

- 5 1. A pack suitable for housing liquid and/or solid-liquid contents whose wall comprises a layer of board, an inner layer sufficiently impermeable to create a seal between the board and the pack's contents, and an outer protective layer covering the board, wherein the pack's layers are microwavable and the outer layer is breathable.
- 10 2. A pack according to claim 1, wherein the outer layer is a varnish and a further layer is provided between the varnish layer and the board which is of ink and which is breathable.
3. A pack according to claim 2 wherein the breathable region is substantially limited to the ink layer area.
- 15 4. A pack according to any preceding claim wherein the breathable region comprises perforations spaced within the range of 5mm to 40mm.
5. A pack according to claim 4 wherein the pitch of perforations is substantially 20mm.
- 20 6. A pack according to either of claims 4 and 5 wherein the perforations are strips.
7. A pack according to any preceding claim wherein the outer layer is formed by strands of appropriate material with gaps formed between the strands acting as breathable regions.
- 25 8. A sheet comprising a layer of board covered by an impermeable layer on one side and a protective layer on the other side covering the board, wherein the layers are microwavable and said protective layer incorporates a breathable region or regions.
- 30 9. A pack substantially as herein before described with reference to and/or illustrated in any appropriate combination of the accompanying text and/or figures.

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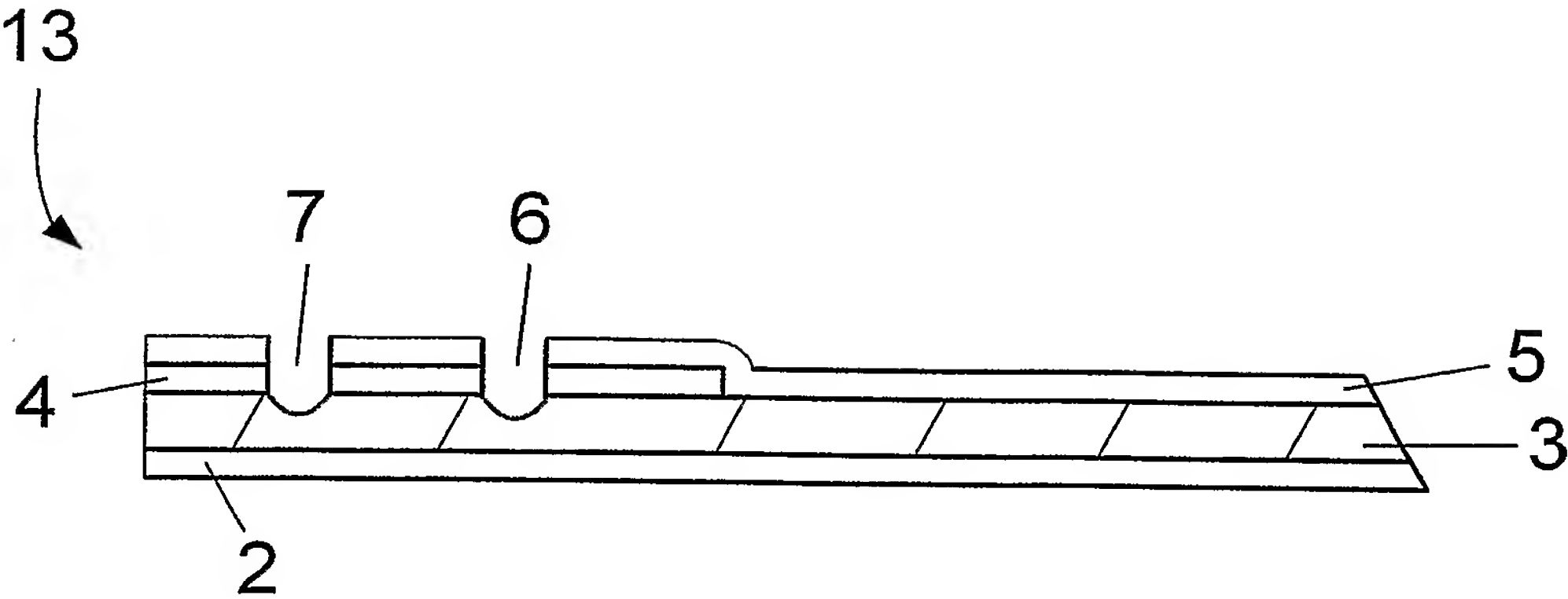


FIGURE 4

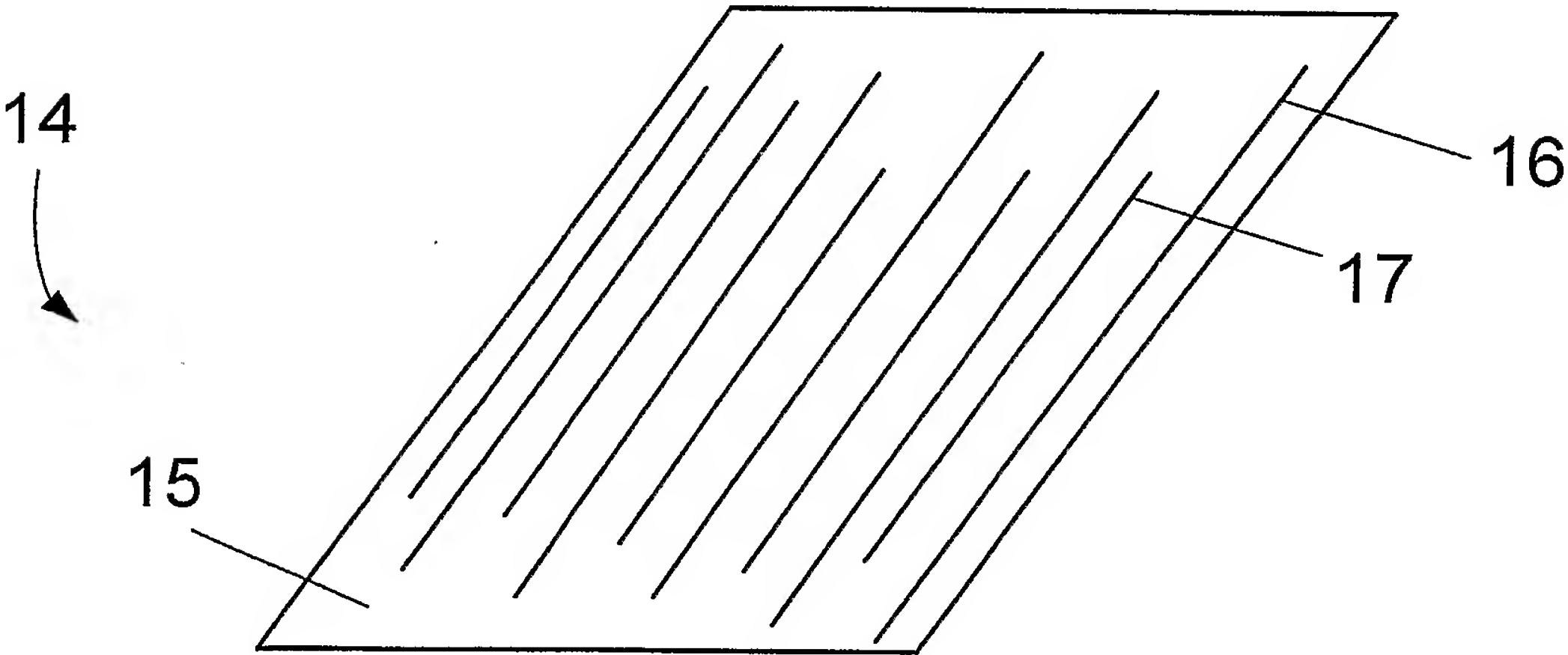


FIGURE 5

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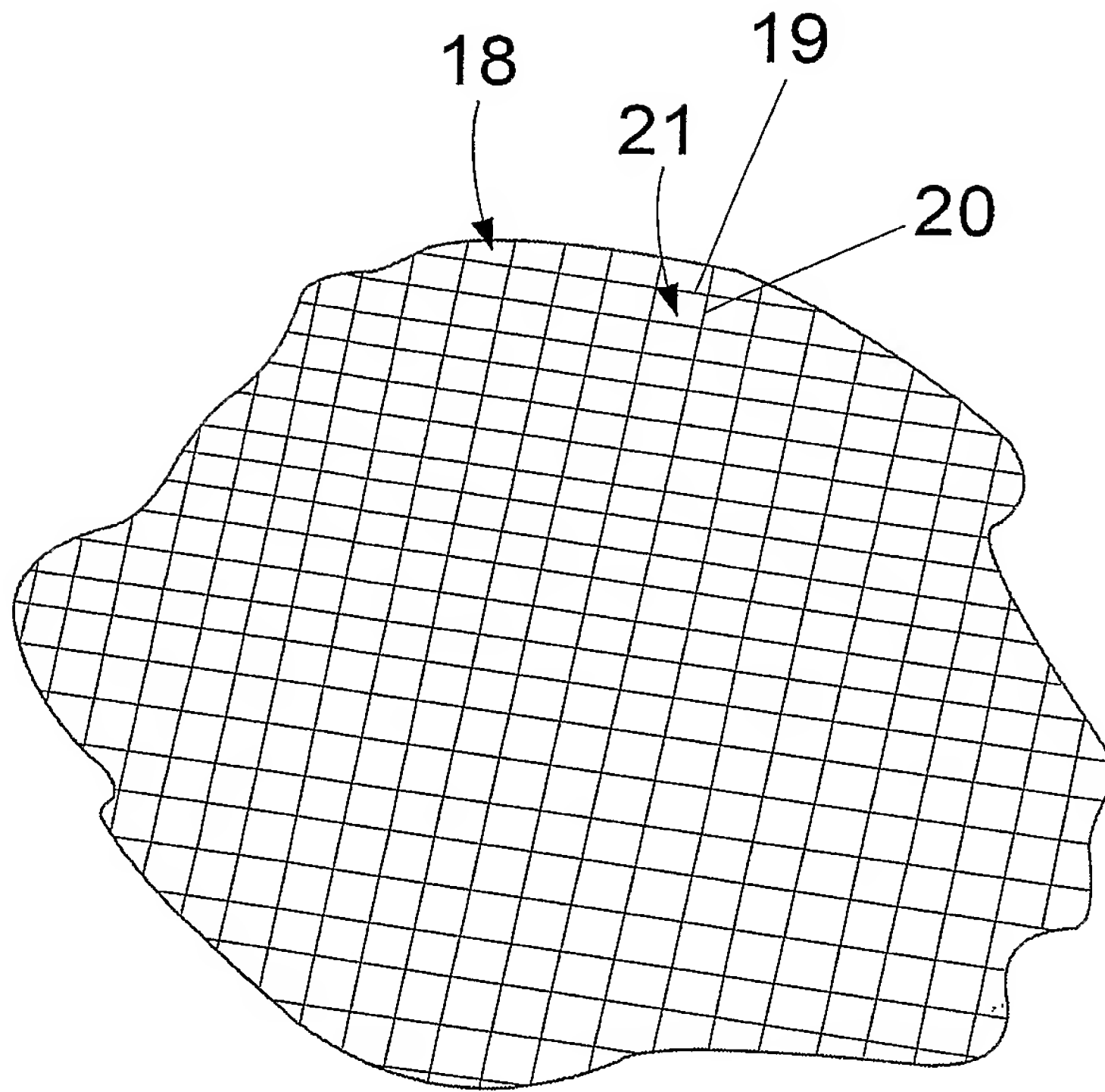


FIGURE 6

INTERNATIONAL SEARCH REPORT

International Application No
CT/GB2004/005231A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65D81/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 386 635 A (MARDON SON HALL LTD) 12 March 1975 (1975-03-12) page 1, line 27 - line 76 page 2, line 27 - line 50; figures 1,2 -----	1,2,4-6, 8
X	US 4 391 833 A (SELF ET AL) 5 July 1983 (1983-07-05) column 1, line 10 - column 2, line 54 column 3, line 50 - column 5, line 11; figures 1-3 -----	1,2,8
X	EP 0 245 005 A (INTERNATIONAL PAPER COMPANY) 11 November 1987 (1987-11-11) page 1, paragraph 1 - page 3, paragraph 3; example 5 ----- -/--	1,2,8

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
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- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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- * & * document member of the same patent family

Date of the actual completion of the international search

17 March 2005

Date of mailing of the international search report

29/03/2005

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No
T/GB2004/005231

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 565 228 A (GICS ET AL) 15 October 1996 (1996-10-15) column 3, line 6 – line 33; figure 5 -----	8
A	EP 0 559 447 A (WESTVACO CORPORATION) 8 September 1993 (1993-09-08) column 4, line 14 – line 47; figure 1 -----	1,8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2004/005231

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.: ⁹
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 6.2(a) PCT
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

T/GB2004/005231

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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